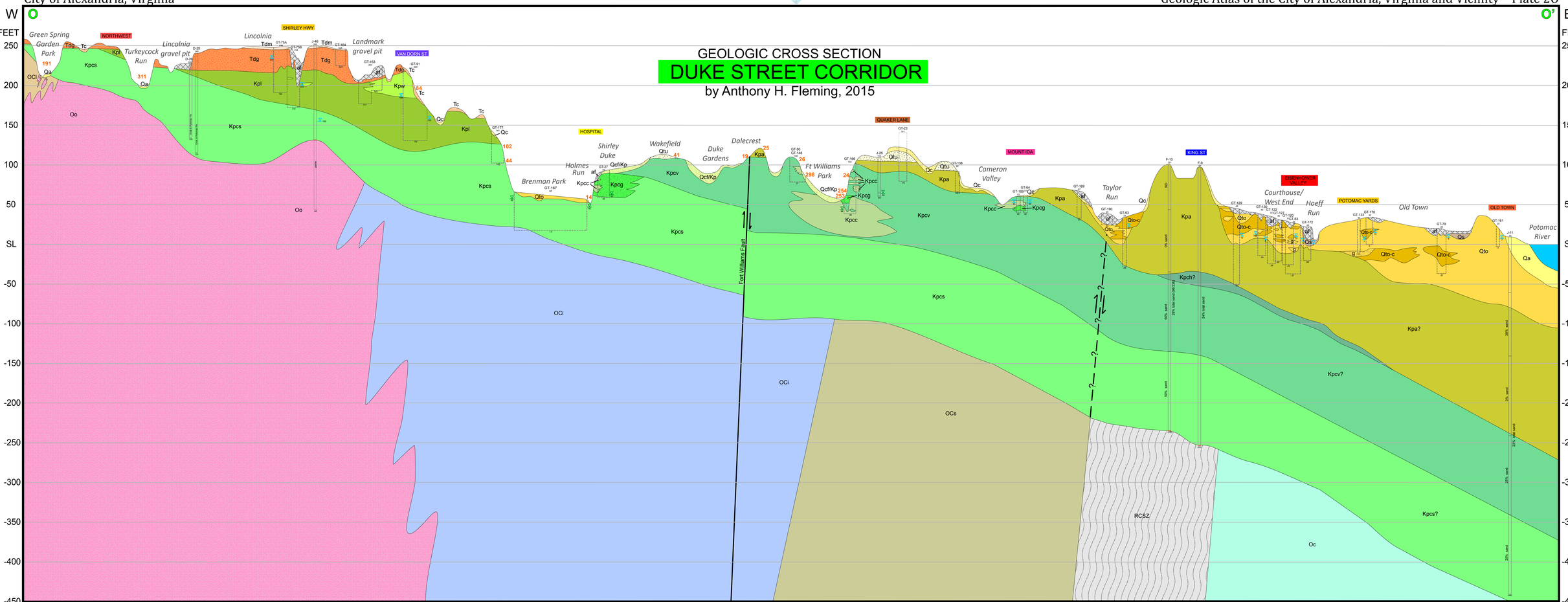


CROSS SECTION 2-O – DUKE STREET

Cross section 2-O follows the Little River Turnpike/Duke Street corridor, starting at Green Spring Garden Park in nearby Fairfax County and terminating at the Old Town waterfront on the north side of Jones Point Park. Duke Street is the main thoroughfare in the southern part of the City, and the corridor includes a variety of familiar neighborhoods and places, such as Lincolnia, Landmark, Brenman Park, Shirley Duke, Wakefield, Dalecrest, Cameron Valley/College Park, and the Courthouse/West End. This is the longest cross section in the Atlas, extending from the feather edge of the Potomac Formation in the far west to the thickest part of the unconsolidated deposits below Old Town. Not surprisingly, it traverses a wide range of landforms, illustrating a variety of geologic features, from the ancient Paleozoic bedrock to some of the youngest deposits in the City. Duke Street also acts as an important link among all the cross sections: by virtue of its great length, it intersects ten other sections and encompasses dozens of geotechnical boring sites, historical water wells, and exposures, along with numerous sites of cultural, historical, and environmental interest. All of these places are indicated by labels and symbols on the cross section. The specific location of the cross section is indicated on Plate 1 by a green section line.

The cross sections are designed to be used together with the geologic maps, particularly Plate 5, to illustrate the third dimension of the map units and their relations to landforms, soil conditions, and water resources. Contacts between map units are approximate and may be gradational or transitional, especially in the Potomac Formation. The abundance of control points (surface exposures, geotechnical sites, wells) along the cross section provides a general indication of the reliability of contact locations. Map units are depicted using the same colors, patterns, and labels as on Plate 5, and the explanation of map units on Plate 5 serves as the legend. The section also depicts some bedrock units and gravelly zones in the Old Town terrace that are present only in the subsurface and thus do not appear on Plate 5.

The part of the cross section between Brenman Park and Old Town occupies a position intermediate between the Cameron Valley and the Hospital escarpment, locally hugging the toe of the escarpment and crossing several major drainages. Physiographic features related to this landscape position include colluvial fans, a variety of stream terraces, and the sand hills that make up a conspicuous part of the landscape between Holmes Run and Fort Williams Park. Further west, the landscape forms a dissected upland plain on the Dowden terrace. The terrace gravel appears to be unusually thick in the vicinity of Landmark, perhaps not surprising in light of the several large gravel pits that formerly operated in that area. Bedrock is very close to the surface at the west end of the section, cropping out extensively in parts of Turkeycock Run; exposures at Green Spring Garden Park feature Occoquon Granite bodies of various sizes intruding well-bedded Lake Barcroft metasandstone.

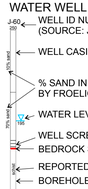
In contrast, the eastern end of the section spans the southern end of the Old Town terrace; a nearly continuous series of geotechnical boring sites in the West End reveal the rather irregular base of the terrace, suggesting a complex history of channel migration as the terrace was deposited. Further east, the terrace thickens dramatically towards the Potomac River. The slope on the base of the terrace is probably less regular than shown, however, and may fall off in one or more east-facing escarpments related to multiple episodes of lowered sea level and channel incision during the Ice Age. Bodies of silt and clay occur along ill-defined horizons within the terrace and suggest multiple episodes of alluviation.

The cross section also exemplifies the regional structure of the bedrock surface and the overlying, southeastward-thickening wedge of Potomac Formation sediments. Most of the observed slope of the bedrock surface is the result of west-to-east tectonic tilting: the bedrock surface falls by more than 700 feet along the length of the cross section (6.5 miles, adjusted for bends in the section). This yields a slope of about 107 feet per mile – a gradient much too steep for the early Cretaceous river system that deposited the predominantly medium sands of the lower Potomac Formation. Such sediments typically are deposited under stream gradients of less than 10 feet per mile. Moreover, the steep eastward slope persists upward through the Potomac Formation: the base of the Arell clay – unusually sharp for the Potomac Formation, and thus readily identified in borings and outcrops – slopes eastward an average of 82.5 feet per mile in the Hospital escarpment between Varsity Park and Quaker Lane, just north of this cross section. The slope is not uniform, however, being about twice as steep east of the Fort Williams fault (127 ft/mile) as it is west of the fault (62 ft/mile). Though less pronounced, similar differences can be seen in the slope of the bedrock surface.

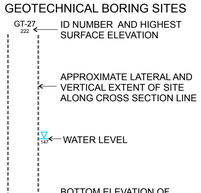
Abrupt changes in the slopes of contacts, together with more direct evidence from elsewhere in the region (e.g., the Stafford and Rock Creek fault zones) indicate that faults of Cretaceous through Quaternary age have played a major role in shaping the structure of the bedrock surface and in tilting the overlying Potomac strata. The Fort Williams fault is the best defined "young" fault zone in the map area, but others probably exist as well, obscured by urbanization and thick surficial sediments. One such feature, indicated on the cross section by the queried dashed line below Taylor Run, may be responsible for the abrupt change in attitude of the Potomac strata in and just west of that area. The same anomaly appears on the King St and Beverley Hills cross sections. Perhaps not coincidentally, this location coincides with the aeromagnetically defined trace of the Rock Creek Shear Zone, which is known to contain young reverse faults in its type locality in the District. Positively identifying the locations of faults from indirect evidence is a daunting challenge in this heavily urbanized area, and is discussed at more length in part 8 of the atlas.

EXPLANATION OF CROSS SECTION SYMBOLS:

WATER WELL



GEOTECHNICAL BORING SITES



WATER LEVELS REPORTED IN WELLS AND GEOTECHNICAL BORINGS

- 119 — WATER LEVEL MEASURED IN WELL OR CASED GEOTECHNICAL BORING COMPLETED IN THE CAMERON VALLEY SAND (LOWER AQUIFER OF THE POTOMAC FORMATION)
- 132 — WATER LEVEL MEASURED IN 1976 FROM WELL COMPLETED IN CAMERON VALLEY SAND (JOHNSTON AND LARSON, 1977)
- 210 — WATER LEVEL MEASURED IN WELL OR GEOTECHNICAL BORING COMPLETED IN OTHER AQUIFERS. MAY REPRESENT A COMPOSITE OR AVERAGE WATER LEVEL AT GEOTECHNICAL SITES WITH MANY BORINGS

OTHER SYMBOLS

- 47 — SURFACE EXPOSURE. SOME EXCAVATIONS COINCIDE WITH GEOTECHNICAL BORING SITES
- g — GRAVELLY ZONES IN THE OLD TOWN TERRACE (Qto) REPORTED IN GEOTECHNICAL BORINGS
- MOUNT IDA — INTERSECTION WITH ANOTHER CROSS SECTION. CROSS SECTIONS ARE DISTINGUISHED BY NAME AND COLOR-CODED SECTION LINES AND TITLES
- –?– –?– — SPECULATIVE POST-CRETACEOUS FAULT OR FLEXURE ASSOCIATED WITH THE ROCK CREEK SHEAR ZONE